most common errors among mankind are those that are based upon fallacies in reasoning rather than errors in observation. Thus, in the present case, we have innumerable reports to the effect that "a black cloud was seen approaching, cannon were fired, and the cloud passed over without hail," or "it passed to one side and the hail did not fall on the protected vineyard," or "it advanced to the edge of the vineyard and there the hail ceased" or "the cloud broke in two, passing to the right and the left, leaving the sky cloudless over the cannon." Now all these are quite common cloud and storm phenomena; they will happen oftentimes without any cannonading. The best friends of the Stiger or Italian method of annihilating hailstorms have recently confessed that the method is still in its infancy or experimental stage and that it is still necessary to investigate and demonstrate its value.

It is not yet time to say with an American writer—

> The cannonading does seem to have some effect in the way of changing hail to rain, and though the exact measure of that effect is still a matter of dispute, chiefly among those who, like the scientific paper mentioned, do more theorizing than observing, yet the owners of the vineyards are convinced that the protection secured is worth much more than it costs.

As to theorizing, those who are best acquainted with the true scientific man know that he is wholly devoted to observed facts, to the recognized laws of nature, and to arguments that are as logical as mathematics. It is the popular writers who are so apt to disseminate ideas that have no scientific basis.

METEOROLOGY AS A COLLEGE COURSE.

In previous numbers of the MONTHLY WEATHER REVIEW we have stated rather fully the recent work of members of the Weather Bureau in the matter of instruction in meteorology, either collegiate or otherwise. It will be interesting to review the early activity of our colleagues in this matter. Thus we understand that in 1887–88, at Northfield, Vt., Prof. H. J. Cox inaugurated a course of meteorology as a member of the faculty of the Norwich University.

In 1885 the president of the Columbian University invited the Editor to establish a course of instruction in meteorology and climatology in the Corcoran scientific school of that institution. In 1877 the board of directors of the Cincinnati University invited Mr. S. S. Bassler, then in charge of the station in that city, to give instruction in meteorology as a part of the regular course of the university. Preparations for this work were completed when Mr. Bassler was transferred to Chicago, Ill., in November, 1877, and the project fell through.

The Editor would be glad to receive short statements of the early services of other men in this special field of college work. If those residing in university or college towns would look up the history of the respective institutions and send us short notes as to the instruction given in our science, usually as a part of the duties of some professor of astronomy, chemistry, geology, or physics, these would constitute interesting contributions to the history of the part taken by American colleges in the development of this science. It is quite common to forget what was done a hundred years ago, but most of us probably know that Prof. Elias Loomis taught this subject quite thoroughly from the beginning of his career at Yale College, 1833; then in the Western Reserve College, at Hudson, Ohio, 1837–1844; again at New York University, 1844–1859, and finally at Yale University from 1860 to 1889.

In former times this subject was usually taught in connection with some other science; thus Prof. Robert Hare, the chemist, wrote and lectured on meteorology in the University of Pennsylvania, 1818–1847. Prof. Joseph Lovering, the physicist, included this in his lectures at Harvard University. His present successor, Prof. John Trowbridge, has also interested himself in vortex motions, atmospheric electricity, and other meteorological problems, but the special teaching of meteorology is left to Prof. R. deC. Ward. Professor Olmstead, at Yale, and now Professor Brewer, at the same institution, also Professor Renwick, at Columbia, have taught meteorology as a part of the courses in physics and chemistry. Professors Chamberlin, at Chicago, and Tarr, at Cornell, include it in geology and physical geography. Nearly all the professors of natural philosophy have given it some attention ever since the days of Newton and Cotes at Cambridge, England, but natural philosophy is now generally broken up into special courses of physics (which is sometimes subdivided into mechanics, optics, acoustics, and electricity), chemistry, geology, meteorology, etc. At the University of Michigan, Prof. M. W. Harrington gave special courses of lectures on climatology for several years before he was appointed Chief of the Weather Bureau. We do not seem as yet to have anything in America quite equivalent to the eminent professorships of meteorology held by Kämtz, at Dorpat, Schmid, at Jena, von Bezold, at Berlin, and Hann, at Vienna.

MARS AND THE EARTH.

On December 16 Professor Pickering, of the Harvard College Astronomical Observatory, received from his assistant at the Lowell Observatory at Flagstaff, in Arizona, a telegram saying that a shaft of light had been seen to project from the planet Mars, lasting seventy minutes. Whenever anything remarkable is observed in the heavens the facts are at once telegraphed to all interested astronomers in order that they may concentrate attention upon the subject, and add as much as possible to our knowledge before the fleeting phenomenon has vanished. This was done in the present case, telegrams being sent to astronomers in both Europe and America. The Lowell observatory gives especial attention to the planet Mars, and has already published a magnificent volume showing the apparent changes that occasionally occur.

This simple announcement of an observed fact has come back to America as a news item scarcely recognizable, viz, that Professor Pickering has been in communication with the planet Mars. This story has brought out from Tesla the statement that he also has observed on his telegraph wires electrical oscillations that may have come from Mars or some other planet, though he does not give us any data by which to judge of the rationality of this conclusion. Following him, Mr. William A. Eddy, of New York, announces that ever since 1890, or whenever he flew his kites by means of metal wire, he was liable to receive electric currents that must have come from some planetary region, or possibly, the sun, or the upper atmosphere.

Following upon these newspaper paragraphs an occasional correspondent inquires, first, as to their authenticity, and next as to their relation with meteorology.

We think we have said enough to show that the original observation published by Professor Pickering is reliable. We believe the other observations by Tesla and Eddy are probably explicable as the result of the ordinary irregularities in terrestrial magnetism, and do not necessarily place us in connection with planetary bodies. Finally, we agree with our colleague, Mr. Talman (and others who have written on the subject for a century past), as to the extreme improbability of there being any one alive on any of the planets with whom we could have intelligent exchange of ideas, even if optical or electrical signals could be sent and received.

Recent studies by means of liquid air have shown that the earth's atmosphere is undoubtedly constantly giving to and taking from interplanetary space a little of the more vol-

atile gases, hydrogen, helium, neon, argon, xenon, and krypton—we might thus occasionally interchange a molecule or two with Mars or Jupiter—but these interesting possibilities should not be heralded as the meteorology of the future. Meteorologists are not studying these finer but the ordinary grosser phenomena of the earth's atmosphere.

At the present time there is absolutely no evidence that the moon or planets have any appreciable influence on the earth, except the well-known ocean tides and the astronomical perturbations due to their gravitational attraction. Of course, they give us a little light in the night-time, but that would scarcely be spoken of as a powerful influence.

OSCILLATIONS OF THE LAKES AND THE CLIMATE IN ARID REGIONS.

The recent reports from Salt Lake City show that the great Salt Lake is now at a lower level than has previously been recorded, by nearly one foot. During the past three years the water available for keeping the lake up to its average height has been materially diminished, that is to say, there has been less rain and snow than the normal, and more sunshine and wind. Similar experiences are reported from India and the Pacific. Thus we learn from a contemporary newspaper that Lieut. O. Olufsen, of the Danish army, well known by his explorations in central Asia and on the Pamir Plateau, says that within the past few years the quantity of water in the streams and wells of Turkestan and Bokhara has notably diminished. This is particularly true of the Syr Daria and the Amu Daria. The Lake Yechil Kul has shrunk from a circumference of 120 miles to one of 40. A somewhat similar story comes from South Africa, where Lake Ngami has dried up greatly within the past ten years, and the natives have been obliged to retire from it.

All these observations do not indicate a permanent change in the condition of the atmosphere. These lakes have all gone through many similar dry periods before this, some of them have dried up very much since they were first formed, but these changes require immense geological epochs. The climatological pendulum swings to and fro very slowly. The annual variations of mean temperature, wind and rain, sunshine and evaporation are rapid and large but they oscillate about the same mean values that obtained a thousand years ago.

EROSION DUE TO HEAVY RAINS AND STEEP GRADES.

The study of physiography teaches us that most of the mountain ranges and hills are simply the outlasting harder portions of the soil and rocks that have not yet been worn down by the steady action of the rains, the frosts, and the rivers. The greatest amount of denudation has taken place in regions of heavy winter freezes and abundant spring and summer rains, but the deepest and most precipitous canyons occur in regions that have but little frost and only occasional but heavy local rains. In these regions a comparatively small watershed of very steep gradient carries a mass of water downward with such force as to do far more erosion and other damage than if the same rain were spread over a longer period of time. Perhaps this principle is well illustrated in the following extract from the Examiner of San Francisco, Cal., November 27. The account there given may be exaggerated, but in general terms it well presents the nature of a phenomenon which is frequently occurring in our arid regions.

On Tuesday, November 20, at Santa Cruz Island, there was a terrific rain. For several hours the water supply poured from the sky, the fall amounting to a cloudburst on the tops of the island mountains. From the harbor a long canyon or valley runs 6 miles up into the mountains, draining an immense watershed and having a fall of about 2,000 feet. A day or two of drizzling rain started the little creek, but it soon became a powerful torrent. Immense volumes of water rushed pell mell down the bed, washing brush, driftwood, and even trees out to sea. The noise was something frightful. It was a low, deep roar from the crashing together of great rocks.

The sloop lay a quarter of a mile off shore in water that was practically fresh. The debris from the island was all around her and the creek waters could be traced far past her. Captain Julius rowed ashore a day later. The beach had receded 100 feet from its former position. The canyon was cleared to bedrock of all movable things.

MIRAGE OVER LAKE MICHIGAN.

A beautiful mirage was witnessed at or near Chicago, Ill., on December 20, 1900, when the observers, looking eastward, saw perhaps 30 or 40 miles of distant lake shore elevated so as to become visible.

The view was elevated above the horizon and was enveloped in a pale blue light. It formed the lower lining of a maze of darkness that hung over the lake shortly after noon and was visible for more than an hour. It faded from view by slowly vanishing from both ends until nothing but the blackened smoke that had floated out from the city's smokestacks remained to be seen.

It appeared in view as slowly and as majestically as it vanished. There was a dark streak between it and the horizon. Prof. H. J. Cox says:

The atmospheric conditions were perfect for such a mirage; there was scarcely a breeze astir; the lake was smooth and the warm rays of the sun slanted down under the bank of smoke.

METEOROLOGY AT THE PARIS CONGRESS OF 1900.

In the Meteorologische Zeitschrift for November, 1900, the editor published a full account of the proceedings of the general Meteorological Congress called by the authorities of the International Exposition, and also of the permanent meteorological committee appointed by the International Congress of Meteorology and its subcommittees. Meteorologists from all parts of the world were in attendance on the congress, and its proceedings were quite interesting. Among the papers worthy of mention were those by Paulsen, on the spectrum of the aurora; Hildebrandsson, on the work of the cloud committee; Sprung, on automatic apparatus for measuring the height and velocity of the clouds; Edelstam, on actinometric measurements made by Angström and himself on Teneriffe with the new Angström pyrheliometer; Algue, on microseismic observations during storms.

In general, however, the attention of the congress was mainly given to the meteorology of the upper regions of the atmosphere. And this was right. The interest that every meteorologist must have in the knowledge of the processes going on in the upper strata of the air was stimulated most thoroughly, and the results described by the untiring and successful students in this field of research called forth, not only expressions of satisfaction and admiration, but gave occasion, even in wider circles, to the mature resolution to actively cooperate with those who have done the pioneer work in the exploration of the upper regions. All the meteorologists best known for their work with balloons and kites (Rotch, Teisserenc de Bort, Assmann, and Hergesell) communicated some account of their arrangements and results. A copy of the magnificent work, in three great volumes, Scientific Balloon Ascensions, by Assmann and Berson, was presented by Assmann. The newest extensions of meteorological services were presented in papers by Rona, on the work of Konkoly and the new Meteorological Observatory in O'Gyalla, Austria; by Nakamura, on the meteorological service of Japan; by Ballif, on the meteorological service in Bosnia and Herzegovina; Chaves, on the meteorological service of the Azores. Weather shooting or hail shooting was reported on for Italy, Hungary, and Austria, and it was agreed that this widespread craze must be utilized as a means of obtaining data for the study of hailstorms. No special subcommittees were appointed by the congress, but the subcommittees of the permanent committee seem to have acted as such, thereby giving rise to some confusion as to the spheres of these two distinct bodies.